TOBACCO SMOKE CONSTITUENTS: IMPORTANT POINTS

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I

Tobacco smoke has been the subject of intensive research over many years, in an effort to identify both the components and constituents of smoke and the effect, if any, smoking may have on humans. By some estimates, over four thousand constituents of cigarette smoke have been identified thus far, and such research is continuing. No constituent as found in cigarette smoke, however, has been scientifically proven to cause cancer or any other human disease.

II

Ninety percent of cigarette smoke is air, water and carbon dioxide, a natural by-product of combustion. Of the remaining ten percent, only a few substances such as nicotine and carbon monoxide (CO) are detectable at levels above one milligram per cigarette. The vast majority of the remaining compounds in cigarette smoke are present only in extremely small amounts, measured in micrograms (millionths of a gram) or nanograms (billionths of a gram) per cigarette. Although under experimental conditions, involving laboratory animals, some substances in cigarette smoke can have a toxic or disease-inducing effect, the concentrations at which a smoker is exposed to these substances have not been determined to have any health effects on humans.

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III

"Tar" is frequently the subject of public comment and criticism by anti-smoking advocates as causing cancer in smokers. "Tar" is not actually present in tobacco smoke; rather, it is a laboratory product obtained by collecting the particulate matter in tobacco smoke, either by passing cigarette smoke through a cold trap at extremely low temperatures or by using filters and a drying process. Thus, no human smoker is exposed to "tar" in the form that it is used for experimentation in the laboratory. Such "tar" has been the subject of animal experiments to investigate the possible relationship between tobacco smoke and cancer. In those experiments, "tar" was repeatedly painted on the shaved backs or ears of test animals over prolonged periods of time. Some of these tests resulted in the production of tumors. These test results, however, should not and cannot be extrapolated to the human smoker. The differences in the method of exposure between skin painting experiments and smoking are obvious. Likewise the concentrations of "tar" used in such experiments are extremely high. Consequently, such experiments involve applying "the wrong material, in the wrong form, in the wrong concentration, to the wrong tissue of the wrong animal."

IV

Nicotine is present in cigarette smoke because it is a natural element of tobacco. Anti-smoking advocates often blame

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nicotine for the development of heart disease. Yet no mechanism by which nicotine, or any other agent, is involved in heart disease has been demonstrated. Moreover, no correlation between the nicotine level of the cigarette or the number of cigarettes smoked and the smoker's actual nicotine intake has been established because of individual variations of puff rates, depth of inhalation, and body metabolism.

V

CO is produced by burning cigarettes, as it is also produced by many natural and man made sources, including automobile exhaust and industrial emissions. Anti-smoking advocates often assert that CO plays a role in the causation of cardiovascular disease. Nonetheless, the question of whether exposure to low or moderate levels of CO have any health effects on humans remains unanswered. Moreover, the exposure to CO from smoking has been described as "insignificant" compared to most other sources.

VI

Increased attention has been focused on the presence of other constituents in cigarette smoke, some of which may have a toxic effect on or be associated with disease in animals or humans at levels and under conditions of exposure greatly different than those encountered by the smoker. Such substances as acetone, ammonia, arsenic, methanol, nitrosamines and phenol -- present in

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cigarette smoke -- are ubiquitous in the environment. They are produced whenever organic matter is burned, whether that be in industrial emissions, through smoking, or in grilling a steak. The levels of exposure to these substances from cigarette smoking is extraordinarily low, and the suggestion that there is something "unique" about the smoker's exposure to these substances is misleading and scientifically irresponsible.

VII

Acetone is present in minute quantities in the vapor phase of cigarette smoke. It has been detected in freeze dried foods and dried milk, and is a naturally occurring constituent of human blood and human. Acetone is not considered toxic at low levels of exposure.

VIII

Acrolein is present in small quantities in the vapor phase of cigarette smoke. It is ubiquitous in the environment as a product of fires, automobile exhaust, and other industrial emissions. Acrolein is also produced by burning foods containing fat, such as grilling a steak. There is no evidence to support the claim that acrolein is a human carcinogen.

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IX

Ammonia is detectable in minute amounts in cigarette smoke. It occurs naturally as a part of protein metabolism in man and virtually all species of animals. Although ammonia at high concentrations is an irritant, the amount of ammonia in cigarette smoke is so low as to have no effect on smokers.

X

Arsenic is a natural occurring metal that is drawn into growing tobacco (and other plants) from the soil. It is present also in rocks, water, and virtually all living organisms. Although arsenic has sometimes been indicated as a possible carcinogen in animal experiments, none of its compounds have been proven capable of causing cancer.

XI

Benzene is present in small quantities in the vapor phase of cigarette smoke. Although benzene has sometimes been suggested as a possible cause of leukemia, leukemia has not been consistently linked to cigarette smoking through the various statistical studies that form the primary basis for public health criticism of smoking.

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XII

Benzo(a)pyrene (BaP) is sometimes singled out as a human carcinogen because it is a component of the laboratory product "tar;" "tar" can produce tumors under the highly artificial conditions involved in animal skin painting experiments. BaP is formed by the incomplete combustion of organic matter. In addition to cigarette smoke, other sources of BaP in the atmosphere are coal and oil fired power stations, domestic heating, automobile exhaust, industrial emissions, and forest fires and volcanic activity. BaP is detectable in fish, meat and vegetables, as well as in tap water.

XIII

Butane may be present in the vapor phase of cigarette smoke in minute quantities. It occurs in natural gas and is present in the atmosphere as the result of the combustion of gasoline and other petroleum products. The inhalation of butane has not been found to have chronic health effects in humans.

XIV

Cadmium is a trace "heavy metal" present in tobacco and in cigarette smoke. The principal source of cadmium exposure for man is in food, dairy products and drinking water. The amount of cadmium in cigarette smoke is so low as to pose no risk of carcinogenicity in humans.

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XV

Hydrogen cyanide (HCN) is present as a component of the vapor phase of cigarette smoke in minute amounts. HCN is also generated by the combustion of carbon materials in air, for example, during home cooking. It is also present in such varied food products as bitter almonds, lima beans, soybeans, apricots and linseed. The level of HCN in cigarette smoke is extremely low, and research indicates that it is rapidly eliminated from the smoker's system.

XVI

Lead is drawn from the soil into growing tobacco. It is present in the air, soil and water, and all persons are exposed to and ingest small amounts of lead each day. The incremental additional exposure of a smoker to lead is inconsequential compared to the intake of lead from other sources.

XVII

Methanol is present in very small qualities in cigarette as a vapor phase component. It is also present in bread, soy sauce and various fruits and vegetables. Although in large concentrations methanol can be a skin and eye irritant, there are no studies showing the inhalation of methanol in the amounts present in cigarette smoke to be carcinogenic.

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XVIII

Naphthalene is a chemical compound present both in "tar" and in the vapor phase of cigarette smoke in small quantities. It is created by the combustion of tobacco and other organic materials. In the home, it is found frequently in air fresheners, moth balls, varnishes and wood preservatives. Naphthalene has no reported carcinogenic effect, although is sometimes associated with leukemia in animal experiments. Leukemia is not consistently statistically associated with cigarette smoking.

XIX

Nickel is drawn from the soil into growing tobacco. The amount of nickel both present in tobacco and transferred into smoke is very small. There is no credible scientific proof that nickel as found in cigarette smoke has any health effect on smokers.

XX

Nitrogen oxides are present in trace amounts in cigarette smoke. The levels are too small to have toxic or chronic health effects on smokers.

XXI

Nitrosamines are detectable in both "tar" and in the vapor phase component of cigarette smoke. Under experimental conditions, certain nitrosamine compounds can produce tumors in labora-

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tory animals. The levels of nitrosamines necessary to produce tumors in animals are extraordinarily greater than the levels of nitrosamines encountered by human smokers. Nitrosamines are also found in soil, air, water and food.

XXII

Phenol is present in minute quantities of cigarette smoke. It occurs naturally in animal tissues; the consumption of meat has been identified as a primary source of human exposure to phenol. Phenol is not present in cigarette smoke at high enough concentrations to have any health effects on smokers.

XXIII

Polonium-210 is a radioactive element present in trace amounts in tobacco and cigarette smoke. It is also present in the atmosphere and in soil. The extraordinarily minute quantities at which it is present in cigarette smoke militate against it having any health effects on smokers.

XXIV

Toluene is a constituent of the vapor phase component of cigarette smoke. It is also present in the atmosphere as a result of industrial emissions, automobile exhaust and gasoline evaporation. Although it is an eye and skin irritant, at low levels and

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concentrations toluene has not been found to be toxic or to cause chronic disease in humans.

XXV

Urethane is present in cigarette smoke in very small amounts. It is also a natural by-product of fermentation, and is found in wines, distilled spirits, and beer, as well as in fermented food products such as cheese, yogurt and soy sauce. Although urethane has been suggested as a possible animal carcinogen, it is not present in cigarette smoke in sufficient quantities to pose a health risk to smokers.

XXVI

Vinyl chloride is present in minute amounts in the vapor phase of cigarette smoke. It is also present in various food products such as honey, butter, ketchup and syrup; it is also present in some wines. Vinyl chloride is present in cigarette smoke at levels too low to be considered carcinogenic.

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